

Amendments to the Claims:

This listing of claims replaces all prior versions and listings of claims in the application:

Listing of Claims:

1. (Currently amended) A semiconductor device comprising:  
a pixel matrix circuit including at least ~~a plurality of~~ source lines, ~~a plurality of~~ and gate lines;  
a driver circuit including at least a source line driver circuit for driving the source lines and a gate line driver circuit for driving the gate lines; and  
a logic circuit for processing a signal required for driving the driver circuit and a signal including image information transmitted to the pixel matrix circuit,  
wherein the pixel matrix circuit, the driver circuit and the logic circuit are disposed over a the same substrate,  
wherein the pixel matrix circuit, the driver circuit, and the logic circuit are constituted by a plurality of thin film transistors, each having an active layer comprising crystalline silicon, ~~and~~  
wherein the active layer of each of ~~said~~ the plurality of thin film transistors ~~comprise~~ comprises a plurality of rod-shaped crystals extending in one direction, and  
wherein the logic circuit includes at least one or more selected from the group consisting of a phase comparator, a LPF (low pass filter), a VCO (voltage controlled oscillator), a frequency divider, a horizontal scanning oscillator, a vertical scanning oscillator, a D/A converter, an I/O port, a differential amplifier, an operational amplifier, a comparator and a memory.
2. (Currently amended) A The semiconductor device according to claim 1, wherein crystal lattices ~~said~~ of the plurality of rod-shaped crystals are continuous within each of the active ~~layer~~ layers so that there is no barrier for carriers within each of the active ~~layer~~ layers.
3. (Currently amended) A The semiconductor device according to claim 1, wherein ~~said~~ the semiconductor device is a liquid crystal display.

D  
cont

4. (Currently amended) A The semiconductor device according to claim 1, wherein ~~said~~ each of the plurality of rod-shaped crystals have has a flattened shape.

5. (Currently amended) A The semiconductor device according to claim 1, wherein ~~said~~ the active layer has an anisotropy between a channel length direction and a channel width direction thereof.

6. (Currently amended) A The semiconductor device according to claim 1, wherein ~~said~~ the active layer includes an intrinsic or substantially intrinsic channel forming region.

①  
Cont  
7. (Currently amended) A The semiconductor device according to claim 1, wherein ~~said~~ the active layer contains an element selected from the group consisting of Ni, Fe, Co, Sn, Pd, Pb, Pt, Cu and Au at a concentration  $1 \times 10^{17}$  atoms/cm<sup>3</sup> or lower, ~~said~~ the element being capable of promoting crystallization of silicon.

8. (Currently amended) A The semiconductor device according to claim 1, wherein ~~said~~ the active layer contains an element selected from the group consisting of Cl, F, and Br at a concentration from  $1 \times 10^{15}$  to  $1 \times 10^{20}$  atoms/cm<sup>3</sup>.

9. (Currently amended) A The semiconductor device according to claim 8, wherein ~~said~~ the element is concentrated at a portion close to a gate insulating film.

10. (Currently amended) A The semiconductor device according to claim 1, wherein ~~said~~ the pixel matrix circuit has a plurality of pixels, and each of ~~said~~ the plurality of pixels is provided with at least two of ~~said~~ the plurality of thin film transistors connected in series.

11. (Currently amended) A The semiconductor device according to claim 1, wherein ~~said~~ the pixel matrix circuit has a plurality of pixels, each of which is provided with a storage capacitor formed between a connect wiring and a black mask.

12. (Currently amended) A The semiconductor device according to claim 11, further comprising an organic film having an opening wherein ~~said~~ the black mask is formed on ~~said~~ the organic film and ~~said~~ the storage capacitor is formed within ~~said~~ the opening.

13. (Currently amended) A The semiconductor device according to claim 11, wherein ~~said~~ the connect wiring comprises a the same material as a source electrode of each of ~~said~~ the plurality of thin film transistors, and ~~said~~ the connect wiring is formed from a the same layer as ~~said~~ the source electrode.

14. (Currently amended) A The semiconductor device according to claim 1, wherein one of ~~said~~ the plurality of thin film transistors constituting ~~said~~ the pixel matrix circuit has a different dimension from one of ~~said~~ the plurality of thin film transistors constituting at least one of ~~said~~ the driver circuit and ~~said~~ the logic circuit.

15. (Canceled)

16. (Currently amended) A semiconductor device comprising:

a pixel circuit;

a driver circuit for driving ~~said~~ the pixel circuit; and

a logic circuit for processing a signal required for driving the driver circuit;

wherein ~~said~~ the pixel circuit, ~~said~~ the driver circuit and ~~said~~ the logic circuit are formed over a the same substrate and constituted with a plurality of N-channel type thin film transistors and a plurality of P-channel type thin film transistors;

wherein subthreshold coefficients of ~~said~~ the plurality of N-channel thin film transistors and ~~said~~ the plurality of P-channel thin film transistors are ~~both~~ within a range of 60 to 100 mV/decade, and

wherein the logic circuit includes at least one selected from the group consisting of a phase comparator, a low pass filter, a voltage controlled oscillator, a frequency divider, an oscillator for a source line driver and an oscillator for a gate line driver.

17. (Currently amended) A The semiconductor device according to claim 16, wherein ~~said~~ the pixel circuit has a plurality of pixels arrayed in rows and columns.

D1  
amt  
18. (Currently amended) A semiconductor device comprising:  
a pixel matrix circuit including at least ~~a plurality of~~ source lines, and ~~a plurality of~~ gate lines;

a driver circuit including at least a source line driver circuit for driving the source lines and a gate line driver circuit for driving the gate lines; and

a logic circuit for processing a signal required for driving the driver circuit and a signal including image information transmitted to the pixel matrix circuit,

wherein the pixel matrix circuit, the driver circuit and the logic circuit are disposed over a the same substrate,

wherein the pixel matrix circuit, the driver circuit, and the logic circuit are constituted by a plurality of thin film transistors, each having an active layer comprising crystalline silicon,

wherein dimensions of ~~said~~ the plurality of thin film transistors are made different depending upon required electrical characteristics ~~by said circuits~~, and

wherein the logic circuit includes at least one selected from the group consisting of a phase comparator, a low pass filter, a voltage controlled oscillator, a frequency divider, an oscillator for a the source line driver circuit and an oscillator for a the gate line driver circuit.

19. (Currently amended) A The semiconductor device according to claim 18, wherein ~~said~~ the dimensions include at least one of a channel length and a thickness of a gate insulating film.

20. (Currently amended) A semiconductor device comprising:  
a pixel matrix circuit including at least ~~a plurality of~~ source lines, ~~a plurality of~~ and gate lines;

a driver circuit including at least a source line driver circuit for driving the source lines and a gate line driver circuit for driving the gate lines; and

a logic circuit for processing a signal required for driving the driver circuit and a signal including image information transmitted to the pixel matrix circuit,

wherein the pixel matrix circuit, the driver circuit and the logic circuit are disposed over a the same substrate,

wherein the pixel matrix circuit, the driver circuit, and the logic circuit are constituted by a plurality of thin film transistors, each having an active layer comprising crystalline silicon,

wherein a thickness of a first gate insulating film of one of the plurality of thin film transistors which ~~are~~ is required to drive a circuit at 0.1 GHz or higher is 500 . or thinner, and a thickness of a second gate insulating film of one of the plurality of thin film transistors which ~~are~~ is driven by an operation voltage of 10V or greater is 1000 . or thicker, and

wherein the logic circuit includes at least one selected from the group consisting of a phase comparator, a low pass filter, a voltage controlled oscillator, a frequency divider, an oscillator for a the source line driver circuit and an oscillator for a the gate line driver circuit.

21. (Currently amended) An active matrix display comprising:  
a pixel matrix circuit including at least ~~a plurality of~~ source lines, ~~a plurality of~~ and gate lines, ~~and a plurality of TFTs~~;

a driver circuit including at least a source line driver circuit for driving the source lines and a gate line driver circuit for driving the gate lines; and

D1  
cont

a logic circuit for processing a signal required for driving the driver circuit and a signal including image information transmitted to the pixel matrix circuit,

wherein the pixel matrix circuit, the driver circuit and the logic circuit are disposed ~~on~~ over the same substrate,

wherein the pixel matrix circuit, the driver circuit, and the logic circuit are constituted by a plurality of TFTs thin film transistors each ~~made of~~ comprising a crystalline silicon thin film,

wherein a plurality of circuits constituting the pixel matrix circuit, the driver circuit and the logic circuit include at least two kinds of circuits which are different from each other in at least one of a driving frequency and an operating voltage, and

wherein the logic circuit includes at least one selected from the group consisting of a phase comparator, a low pass filter, a voltage controlled oscillator, a frequency divider, an oscillator for a the source line driver circuit and an oscillator for a the gate line driver circuit.

22. (Currently amended) The semiconductor device according to claim 1, wherein ~~said~~ the semiconductor device is an EL display.

23. (Currently amended) The semiconductor device according to claim 16, wherein ~~said~~ the semiconductor device is an EL display.

24. (Currently amended) The semiconductor device according to claim 18, wherein ~~said~~ the semiconductor device is an EL display.

25. (Currently amended) The semiconductor device according to claim 20, wherein ~~said~~ the semiconductor device is an EL display.

26. (Currently amended) The semiconductor device according to claim 21, wherein ~~said~~ the semiconductor device is an EL display.

27. (New) A semiconductor device comprising:

a pixel circuit;

a driver circuit for driving the pixel circuit; and

a logic circuit for processing a signal required for driving the driver circuit;

wherein the pixel circuit, the driver circuit and the logic circuit are formed over the same substrate and constituted with a plurality of N-channel type thin film transistors and a plurality of P-channel thin film transistors,

wherein subthreshold coefficients of the plurality of N-channel thin film transistors and the plurality of P-channel thin film transistors are within a range of 60 to 100 mV/decade, and

wherein the logic circuit includes a phase comparator, a low pass filter, a voltage controlled oscillator, a frequency divider, an oscillator for a source line driver and an oscillator for a gate line driver.

28. (New) The semiconductor device according to claim 27, wherein the pixel circuit has a plurality of pixels arrayed in rows and columns.

29. (New) The semiconductor device according to claim 27, wherein the semiconductor device is an EL display.

30. (New) A semiconductor device comprising:

a pixel matrix circuit including at least source lines and gate lines;

a driver circuit including at least a source line driver circuit for driving the source lines and a gate line driver circuit for driving the gate lines; and

a logic circuit for processing a signal required for driving the driver circuit and a signal including image information transmitted to the pixel matrix circuit,

wherein the pixel matrix circuit, the driver circuit and the logic circuit are disposed over the same substrate,

D1  
cont

wherein the pixel matrix circuit, the driver circuit, and the logic circuit are constituted by a plurality of thin film transistors, each having an active layer comprising crystalline silicon,

wherein dimensions of the plurality of thin film transistors are made different depending upon required electrical characteristics, and

wherein the logic circuit includes a phase comparator, a low pass filter, a voltage controlled oscillator, a frequency divider, an oscillator for the source line driver circuit and an oscillator for the gate line driver circuit.

31. (New) The semiconductor device according to claim 30, wherein the dimensions include at least one of a channel length and a thickness of a gate insulating film.

32. (New) The semiconductor device according to claim 30, wherein the semiconductor device is an EL display.

33. (New) A semiconductor device comprising:

a pixel matrix circuit including at least source lines and gate lines;

a driver circuit including at least a source line driver circuit for driving the source lines and a gate line driver circuit for driving the gate lines; and

a logic circuit for processing a signal required for driving the driver circuit and a signal including image information transmitted to the pixel matrix circuit,

wherein the pixel matrix circuit, the driver circuit and the logic circuit are disposed over the same substrate,

wherein the pixel matrix circuit, the driver circuit, and the logic circuit are constituted by a plurality of thin film transistors, each having an active layer comprising crystalline silicon,

wherein a thickness of a first gate insulating film of one of the plurality of thin film transistors which is required to drive a circuit of 0.1 GHz or higher is 500 Å or thinner, and a thickness of a second gate insulating film of one of the plurality of thin film transistors which is driven by an operation voltage of 10V or greater is 1000 Å or thicker, and

D1  
cont



Applicant : Yamazaki, et al.  
Serial No. : 09/924,337  
Filed : August 6, 2001  
Page : 10 of 14

Attorney's Docket No.: 07977-211003 / US3517D1D1

wherein the logic circuit includes a phase comparator, a low pass filter, a voltage controlled oscillator, a frequency divider, an oscillator for the source line driver circuit and an oscillator for the gate line driver circuit.

*D<sup>1</sup> concl.*

34. (New) The semiconductor device according to claim 33, wherein the semiconductor device is an EL display.

---